An Analysis Of Non-Migas Sector Trade Balance For Indonesia's Largest Trading Partner: Autoregressive Distributed Lag Approach

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Abstract. In this work, we examine the monthly impact of the real effective exchange rate (REER) on the bilateral trade balance between Indonesia and its six major trading partners (Japan, China, the United States, and Europe) from 2005 to 2021. The method of autoregressive distributed lag (ARDL) is used in this investigation. This research aims to explain why and how Indonesia's trade balance has improved after the J curve was first demonstrated there. As a result of this study, the J curve was developed to help fix the trade deficit. The bilateral trade balance between Indonesia and China exhibits a J curve phenomena in the short run. Since a J curve is correlated with the characteristics of the trade, this proves that it is a head-to-head phenomena. Therefore, trade characteristics should be taken into account by the mechanism for correcting the trade balance in reaction to the exchange rate shock (i.e. intervention in the exchange rate market).

Keywords: J-Curve, Exchange rate, Balance of Trade, ARDL

1. Introduction

Trade is made according to a mutual agreement and done by individuals with individuals, individuals with governments, and states with states (1). For emerging economies, such as Indonesia global economic fluctuations significantly influence economic performance through various pathways. One of the most stressed pathways is commerce (2020). The exchange of goods and services also involved an economic transaction. Economic transactions themselves are activities in which there is an exchange of goods or services involving both money and assets (2). Thus it may be concluded that international trade involves a stream of transitory ownership of goods or services that penetrate the borders of a state.

A tool for measuring a country's international trade activities is a trade balance. A record of economic transactions which are carried out by citizens of a country with a worldwide population over some time (3). He said the rupiah was expected to strengthen to Rp9,100 per dollar in the Jakarta interbank spot market on Tuesday. Exports have helped reduce the impact of domestic markets by expanding market targets to global markets (4). He said the Rupiah was expected to strengthen to Rp9,100 per dollar in the Jakarta interbank spot market on Tuesday. The country that carries on international trade activities will have a trade balance that will note imports. A trade balance is also an indicator of how a country's economy, including the one facing a crisis.
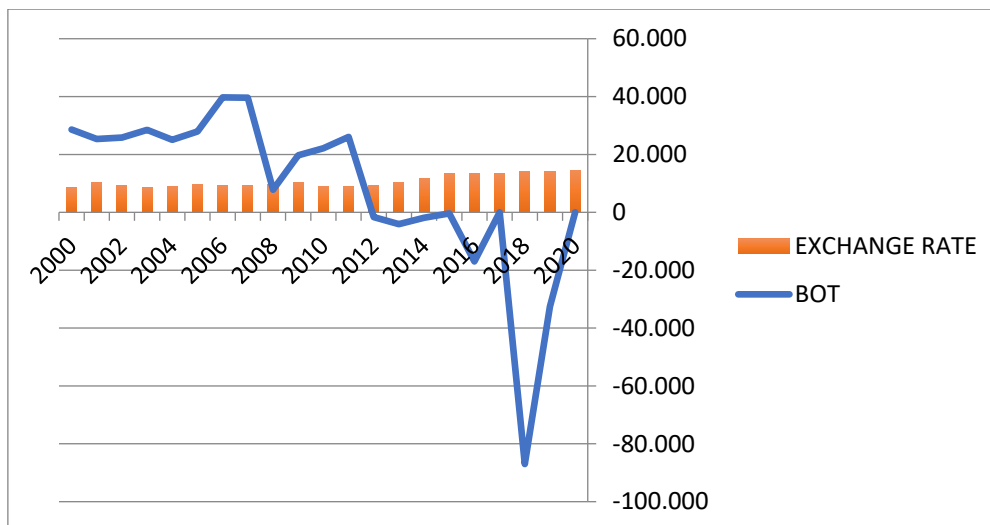
Fig 1. Rupiah's Exchange Rate and The Bilateral Of Trade Indonesia from 2000 to 2020

According to (5) Indonesia's economic growth in the third quarter of 2008 has been around three times as the country's leadership period of Indonesia has been implemented. In the first semester of 2008, the company's net profit in the first semester of 2008 fell to Rp778.1 trillion from Rp77.9 trillion in the same period last year. On November 15, 1974-December 1995 used the managing floating exchange rate system.

The causes of trade balance (6) are (a) the surplus in trade scales as a result of declining exports and/or increasing import of goods. The 2012 crisis showed this, where the surplus on the balance sheet of commerce fell more than 75% over 2011, (b) in addition to goods, merit balance-sheet deficits, and (c) Netto (net income). The country's balance sheet and net income have declined over the past eight years, making it the largest contributor to running deficit transactions. In the second quarter of 2007, bank Indonesia the central bank/bi decided to raise its interest rate by 25 basis points to 8.25 percent. The rupiah was expected to strengthen to Rp9,100 per dollar in the days ahead, he said. It is also due to the growing deficit of current transactions, causing an imbalance in the foreign market valuta domestic. However, the rupiah still had a chance to strengthen to Rp9,100 per dollar, he said.

The theoretical increase in trade scales will only increase as real exchanges become depreciated (7). The rate of domestic goods is lower due to depreciation. So it would boost competitiveness that would lead to increasing domestic demand for goods overseas, which would eventually increase trade scales. As for the import of real exchanges, it can hurt an impact on import demand (8). Depreciation would cause people to lower their purchasing power of foreign goods, reducing the volume of imports. If the price of Reer rises, foreign societies will shift their spending to purchase domestic goods, which will lower the volume of imports.

He said the Rupiah was expected to strengthen to Rp9,100 per dollar in the Jakarta interbank spot market on Tuesday. This is also because many economic sectors have brought down production/activity such as the manufacturing and construction industries, the implication of the import sector particularly, of raw materials for production has also been reduced. He said the rupiah was expected to strengthen to Rp9,100 per dollar in the Jakarta interbank spot market on Tuesday. He said the rupiah was expected to strengthen to Rp9,100

per dollar in the Jakarta interbank spot market on Tuesday. The government is optimistic the rupiah will continue to strengthen to Rp9,100 per dollar in the Jakarta interbank spot market on Monday as investors bought the local unit on Tuesday.

He said the rupiah was expected to strengthen to Rp9,100 per dollar in the Jakarta interbank spot market on Tuesday. Indonesia's trade activities with many major trade partners fell in 2021, among them China, Japan, and India. Here is the data on Indonesia's trade partners in 2020.

The research gap where real exchanges in value deductions can not always improve the trade balance's performance - Lerner and the J-Curve phenomenon. The difference between the results of the study and the purpose of the study is to understand Reer's impact on exports and imports and thus affect the trade balance's performance. The study also analyses whether Marshall's condition - Lerner and the phenomenon j - curve on the trade balance in Indonesia's major trade partners."

2   Literature Review

Some studies above suggest that a changeover in the exchange rate of a currency would influence a shift in the balance of commerce and output change. The change in real exchange values affects relatively low or more costly costs of products from other countries, so exchange rates are often used to increase competitiveness.

The trade balance itself is the difference between exports and imports made by a country. A trade balance deficit is established when countries import more than export. On the other hand, a trade balance surplus will develop if a country uses more exports than imports. One of the factors that affect the balance of goods is exports as well as imports and one of the factors that normally affect imports is the national income from countries since this factor will determine the insignificance of consumption of an item. To get a general idea of the results of this study as well as in a hypothetical analysis for a temporary answer to the problem problem problem problem can be modeled in the following equations to data transformed into a natural logarithm (ln). The coefficient of exchange rates has a negative and significant impact on the trade balance. He said the rupiah was expected to strengthen to Rp9,100 per dollar in the Jakarta interbank spot market on Tuesday. It shows results where exchange rates have a coefficient of -1.920206. Every exchange rate increases by 1%, then the trade balance will go down by 1,2%.

The real exchange rate effects on the balance of trade: comparable and the Marshall-Lerner condition (9). The results of this study are trying to measure the impact of a real exchange value on the balance sheet of payments using a vector autoregressive vector lag (VARDL) of output and foreign, trade balance, and real exchange value. The research is for OCED countries. The result is the apparent effect of the j curve and the fulfillment of its long-term ml condition.

Research entitled literacy of the Marshall-Lerner condition: a literature review. The author has estimated the elasticity of trade in 29 countries over the last decades. Using the ARDL cointegration method. From a full review, it can be taken as a result that many studies show fulfilled sleeping conditions (10).

With the name testing j curve phenomenon n in Vietnam: an auto show distributed lag (ARDL) approach. The study uses ARDL. The result of this study is that in the short term the

depreciation of exchange rates affects the drop in the trade balance, but in the long run, the depreciation of exchange rates affects the positive on the trade balance or the J-Curve(11).

Some studies above suggest that a changeover in the exchange rate of a currency would influence a shift in the balance of commerce and output change. Some of the research that's been described above has some variation in analytical methods, the state that is used as an object of study, and the results obtained. The change in real exchange values affects relatively low or more costly costs of products from other countries, so exchange rates are often used to increase competitiveness

3 Methods

This study goes through the steps of assessing descriptive statistics, testing for unit root, identifying the types of correlations among variables, modeling those relationships, and finally, admitting the model's robustness. This study used a method of data analysis called Auto Regressive Distributional Lag (ARDL) cointegration, which was created by (12) and then refined by Pesaran, Shin, and Smith (2001).

The method of analysis is the approach used to analyze how each variable affects the variables. Referring to the time avalanche model in this study are several analysis steps that involve testing station, cointegration bound testing, and the ARDL methods and classical assumptions. Testing methods with autoregressive distributed lag (ARDL are dynamic test methods in economics. The ARDL test model is a combination of autoregressive (ar) and myriad lag (dl). The advantage of using the ARDL test model is that data stations can vary, but no data is stationary on the second difference.

This work uses (10) , (13), (14), (15), (16), (17), and (18) ECM requirements, among others that can be written down:

$$\Delta LNBT_t = \beta_0 + \beta_1 LNGDP\text{-}_{Indo} + \beta_2 LN\ GDP\text{-}_{J},t + \beta_3 LNRER_{j,t} + \varepsilon_t$$

Table 1. Operational Definition

Variables	Description	Source
BT	Indonesia's Trade Balance With Trading Partner j defined as the ratio of Indonesia's Exports to Country j over her imports from country j.	Direction of Trade Statics of IMF
GDP-Indo	Index of Indonesia's real GDP	International Financial Statistics of IMF
GDPj	Index of Real GDP of Partner j	International Financial Statistics of IMF
REXj	Bilateral real exchange rate between rupiah and partner j's currency. It is defined as $(P_j \times NEX_j)/P_{indo}$, where P_{Indo} is Indonesia's CPI, Pj is the trading partner's CPI, and NEXj is the nominal bilateral exchange rate defined as the number of rupiah per unit of partner fs currency. Thus, an increase in REX is a	International Financial Statistics of IMF

Variables	Description	Source
	reflection of real depreciation of the rupiah. When making this determination, we consulted the work of Darvas (2012), Sang Ho (2012), Chiu, Lee, and Sun (2010), Baak (2008), and Halicioglu (2009). (2008).	

The ARDL model in the correct model of the equation is:

$$\text{BT} = \alpha_0 + \sum_{i=1}^{n} \alpha 1i \, \Delta Y_{t-1} + \sum_{i=1}^{n} \alpha 2i \, \Delta \log GDP \, Indo_{t-1} + \sum_{i=1}^{n} \alpha 3i \, \Delta \log GDP \, J_{t-1} + \sum_{i=1}^{n} \alpha 4i \, \Delta \log RER_{t-1} + \theta_1 Y_{t-1} + \theta_2 \text{LogGDP Indo}_{t-1} + \theta_3 \text{Log GDP J}_{t-1} + \theta_4 \text{Log RER}_{t-1} + u_t$$

4   Results

Problems that are often found in time series are problems with data stationarity. This problem becomes important considering the regression carried out under conditions containing a unit root (not stationary) will produce spurious regression, which is a condition where the regression results are shows a high coefficient of determination, and statistically meaningful, but theoretically, there is no significant relationship. The reliability of the time series says it is stationary if the average variance and cocktail are constant throughout the period time. Methods of late are widely used By economists to test data stations is the root test unit. Tests in this study are done using this. Dicky fuller's augmented computer testing model was introduced by dickey Fuller (19). Showed the results of the root test unit using Dicky fuller's augmented testing model. From the results of the root test units, all stationary variables are in the first difference.

Table 2. ADF Test In Level and First Difference

Variabel	Stationarity			
	Level		First Difference	
	|t-statistic|	Decision	|t-statistic|	Decision
D(LN_BT_AS)	-0,290	Non-Stationary	-10,712	**Stationary**
D(LN_BT_AUSTRALIA)	-5,019	Stationary	-15,183	**Stationary**
D(LN_BT_JEPANG)	-4,029	Stationary	-12,426	**Stationary**
D(LN_BT_CHINA)	-2,863	Non-Stationary	-16,117	**Stationary**
D(LN_GDP_AS)	-2,416	Non-Stationary	-15,066	**Stationary**
D(LN_GDP_AUSTRALIA)	-14,211	Stationary	-12,130	**Stationary**
D(LN_ GDP _INDONESIA)	-11,740	Stationary	-10,473	**Stationary**
D(LN_ GDP _JEPANG)	-14,622	Stationary	-10,829	**Stationary**
D(LN_ GDP _CHINA)	-4,018	Stationary	-23,904	**Stationary**
D(LN_REER_AS)	-1,532	Non-Stationary	-6,714	**Stationary**
D(LN_ REER _AUSTRALIA)	-2,563	Non-Stationary	-9,989	**Stationary**

Variabel	Stationarity			
	Level		First Difference	
	|t-statistic|	Decision	|t-statistic|	Decision
D(LN_ REER _JEPANG)	-1,586	Non-Stationary	-7,073	**Stationary**
D(LN_ REER _CHINA)	**-1,952**	**Non-Stationary**	**-8,601**	**Stationary**

Based on the data obtained, there are still countries whose data are incomplete, but researchers will still try to obtain data for each country sampled in this study. At the level, several variables are not stationary, so it is necessary to look at the variables at the first difference level. The result shows that all variables can be stationary at the first difference level with various conditions. So that the autoregressive distributed lag (ARDL) model is feasible to use.

Table 2. The Results of F-test when Lags are Selested by The AIC

Negara Mitra dagang	Lag Optimum
Amerika Serikat	4,0,0,2
Australia	2,1,0,0
China	3,0,0,0
Inggris	3,0,0,0
Jepang	2,1,4,4

When viewed carefully, the appropriate model for the ARDL method in this study is the ARDL which is table 4 above. Because it has a very small error when compared to other ARDL models.

The next stage is testing the cointegration of the model, suggested that the cointegration test aims to determine whether non-stationary variables are cointegrated or not (12). The cointegration test used in this study uses the Bound Test approach. In In this approach, cointegration can be seen from the F-statistic value with a critical value which has been compiled by Pesaran and Shin (12). There are two critical limit values asymptotic to test for cointegration when the independent variable is integrated at I(d) where (0 d 1). The lowest value (lower bound) assumes a regressor integrated at I(0) while the highest value (upper bound) assumes a regressor on I(1). If the F-statistic value is below the lower. Value bound, it can be concluded that there is no cointegration. If the value of the F-statistic is above the upper bound value, it can be concluded that cointegration occurs. However, if the F-statistic is between the lower bound and upper bound values, then the result is inconclusive. Cointegration test results with using the bound test approach can be seen in the table below:

Table 3. Cointegration

Mitra Dagang	Nilai F-Statistik	A = 5%		Kesimpulan
		I0 Bound	I1 Bound	
Amerika Serikat	2,003	2,79	3,67	No Cointegration
Australia	4,416	2,79	3,67	Cointegration
China	1,513	2,79	3,67	No Cointegration
Inggris	3,938	2,79	3,67	Cointegration
Jepang	6,508	2,79	3,67	Cointegration

From the table above, it is known that for trading partners Australia, Inggris and Japan, there is a stable long-term relationship between the variables of Indonesia's bilateral trade balance. For America and Japan, the F-stat value is below the lower bound and upper bounds for a significance level of 10%, 5%, and 1%. This means that there is no long-term relationship between the variables.
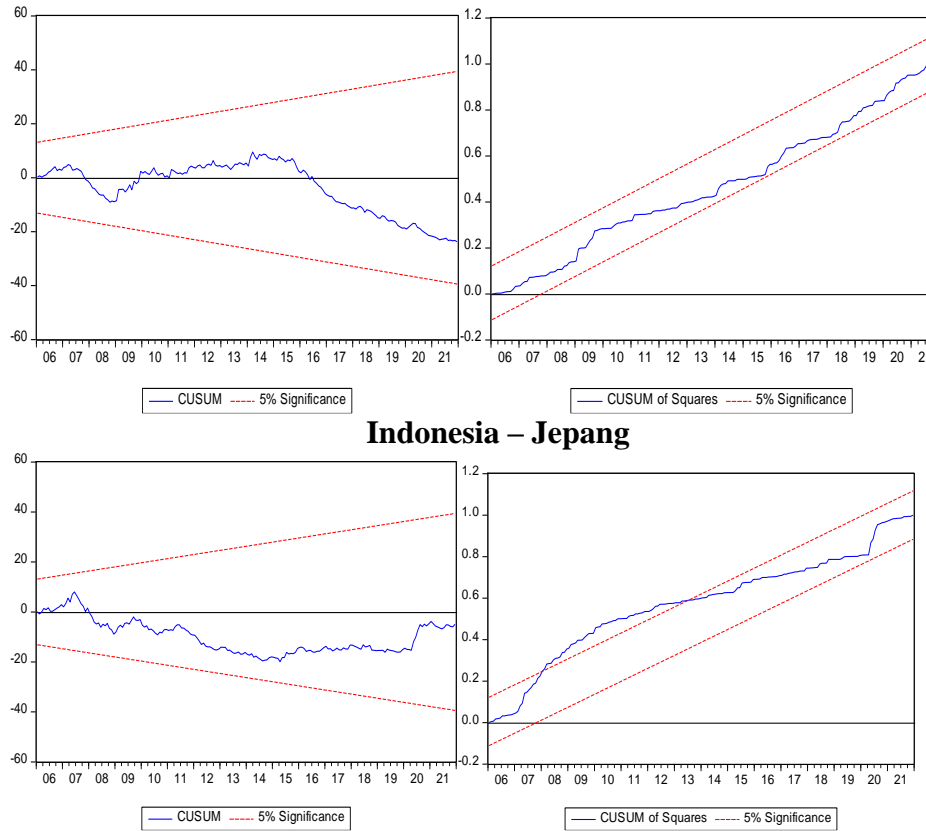
Indonesia – Amerika Serikat
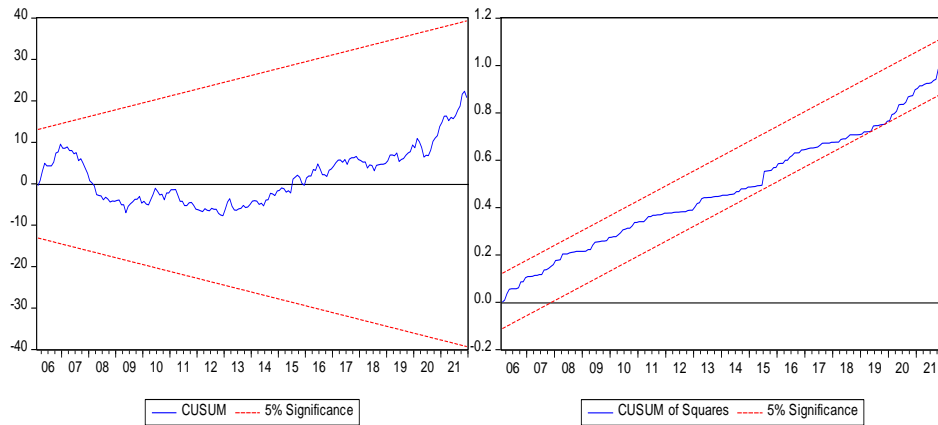
Indonesia - Australia

Indonesia – China

Indonesia – Jepang
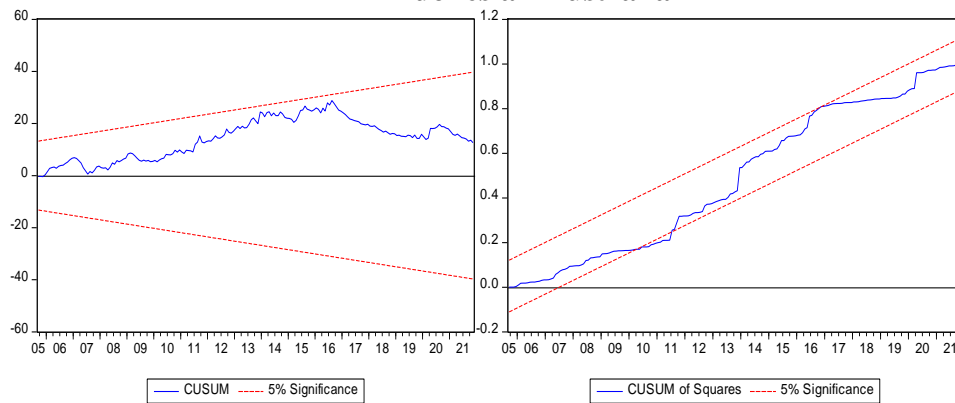
Fig 2. llustrates the charts of the CUSUM and CUSUMQ tests for parameter stability

In addition to diagnostic tests, in this study, stability or parameter consistency tests were also carried out on the best model using the CUSUM and CUSUMQ tests. The results show that all parameters of the estimation results are structurally stable between the United States and Australia trading partners during the analysis period so that they can be used for forecasting and policy analysis, this is indicated by the CUSUM and CUSUMQ plots are within the 5% critical bounds interval. Meanwhile, trading partners China and Japan are less stable between times during the analysis period so that they can be used for forecasting and policy analysis, this is shown from the CUSUMQ plot which is out of the 5% critical bounds interval.

The long-term response describes a stable state between the exchange rate and the trade balance. When a stable long-term response is met then in certain short-term dynamics the system is in a new equilibrium. This happened to Indonesia and its trading partner Australia. According to (20) that whatever the model and data used in this related research, the short-term effect of exchange rate depreciation on the trade balance does not follow a certain pattern so that the results will be different for each country. In this paper, the depreciation of the exchange rate on the bilateral trade balance between Indonesia and its 4 trading partners.

In selecting the best model based on AIC. Then the F bounds testing was carried out again to determine the cointegration relationship between variables from Indonesia's bilateral trade balance with 4 trading partners.

The results of the F Bounds Testing for Australia and China have an upper critical value of 1%, meaning that these two countries have a long-term relationship while the United States and Japan have a value below the upper critical value. This means that H0 is rejected, which means that there is no stable long-term (cointegrated) relationship between the research variables.

4.1 Results and Discussion of ARDL (Autoregressive Distributed Lags) model estimation

The low performance of the trade balance can lead to the use of an external approach as a policy to increase the competitiveness of a country. There are two aspects of the trade balance reaction to changes in exchange rates, namely short-term and long-term responses. In the long run, it explains the stable condition between the new exchange rate price level and the trade balance. When a stable long-term response is met after going through certain short-term dynamics, the system is in a new equilibrium (21)

Through the types of models and data used for this study, the short-term effect of exchange rate depreciation on the trade balance has a different pattern so that each trading partner also has different results (country specific) (22).

If you follow the J-curve hypothesis proposed by (23) then the J-curve is defined as a short-term negative effect combined with a long-term positive effect. So to find out whether or not there is a J-curve effect, information is needed on the long-term effect of real exchange rate depreciation on Indonesia's bilateral trade balance with its four trading partners.

Table 4. Result long run and short run ARDL

The Model	Variable	Long term Coeffitient	t-stat	Variable	Short term Coeffitient	t-stat
Indonesia - Australia	LNGDP_t	-0,0307	-1,1906	DLNGDP_AUS	-0,0100	-1,255
	LNGDP_I	0,0041	0,0551	DLNGDP_INDO	0,0013	0,0551
	LNREER	0,1258	0,0988	DLNREER_AUS	0,2266	1,6026
				ECT	-0,346[***]	
Indonesia -China	LNGDP_t	-0,2304	-2,334[***]	DLNGDP_CINA	-1,5131	-3,258[***]
	LNGDP_I	0,0108	0,0684	DLNGDP_INDO	-0.0045	-0,028
	LNREER	0,4806	3,0318[***]	DLNREER_CINA	0.2591	1,339
				ECT	-0,153	
Indonesia -Jepang	LNGDP_t	2,03E-22	1,1038	DLNGDP_JPG	4,7E-23	1,136
	LNGDP_I	0,0036	0,0576	DLNGDP_INDO	0,0008	0,0576
	LNREER	0,0292	2,2498[***]	DLNREER_JPG	0,0068	1,841
				ECT	-0,333[***]	
Indonesia -Amerika	LNGDP_t	-0,0376	-1,1224	DLNGDP_AS	-0,0060	-1,204
	LNGDP_I	-0,1908	-2,0141[***]	DLNGDP_INDO	-0,0088	-0,658
	LNREER	-0,0552	-0,6413	DLNREER_AS	-0.030	-2,138[***]
				ECT	-0,185[***]	

A long-term estimate of Indonesia's trade balance with its six most important trading partners recommends the following:

1. LNGDP_t factors influence negative and significant LNTB variables in Indonesia's trade model with the United States. This indicates that Indonesia's domestic income raises the demand for imported commodities and, thus, reduces the trade balance sheet over time. In contrast, Indonesia's relationship with China is negative but negligible.
2. LNGDP_t factor could have a negative and major impact into Indonesia's trade model with China. This demonstrates that the increase in domestic income of China's trading partners enhances demand for Indonesia's exports by reducing its long-term balance sheet.
3. LNREER factors influence negative and substantial to LNBT Indonesia's trade model with China and Japan.This indicates a long-term improvement in the commercial balance sheet as a result of exchange rate depreciation.

The short-term estimation table indicates that:
1. Indonesia's trade balance with its top four trading partners (Japan, China, the United States, and Australia) suggests a negative and considerable value in the near future. Due to a current account deficit, Indonesia's trade surplus with Japan is forecast to grow in the next reporting period, thereby resolving the imbalance.
2. The Indonesian model has the highest ECT value, or rate of return to equilibrium, compared to those of Australia (0.346), Japan (0.333), the United States (0.185), and China (0.346). (0.153)
3. The Indonesian trade model with China is significantly and negatively impacted by the fluctuating income of local trading partners. China's rising middle class will boost demand for Indonesian imports and narrow the trade deficit in the short run.
4. The trade model between Indonesia and Japan is positively and insignificantly affected by the variable income of local trading partners. Increasing Japan's domestic income has a positive effect on Indonesia's trade surplus in the short term.
5. In the short term, the trade model between Indonesia and the United States is negatively impacted by the variable Real Exchange Rate (REER).

5 Conclusion

Based on the estimation results, it is known that the short-term and long-term effects (with different levels of effect variation for each country) of the depreciation of the real exchange rate on the ratio of Indonesia's bilateral trade balance with its four trading partner countries, namely the United States, Japan, China, and Australia.

The negative sign of the REER variable is reflected in the long-term impact of the j curve on the United States' trading partners, as shown in the table above. As a result, Marshall-Lerner is not met for Indonesia with the United States as a trading partner, and the negative impact on the REER on the trade balance persists over the long run.

In the short term, it can be seen that the REER coefficient is negative for the United States, and the long term coefficient is positive for the other three countries, namely Australia, China and Japan with a confidence level of 1%. this indicates that Marshall Lerner fulfilled Indonesia's bilateral trade balance with these four trading partner countries.

The income effect of trading partners Australia, China and the United States is negative between Indonesia's trade balance. In accordance with the research conducted (Husman, 2007). This means that the economic growth of these three countries causes an increase in the

production of their substitute imported goods, thereby reducing their import demand and making Indonesia's bilateral trade balance with these three countries worse.

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